

TCE, an industrial degreaser, and technetium-99, a radionuclide fission product from nuclear fuel, were discovered in the wells. This discovery prompted the government to provide municipal water free of charge to all residences and businesses in an area bounded by the Ohio River to the north, by the DOE property to the south, by Metropolis Lake Road to the east, and by Bethel Church Road to the west. Under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), DOE and the EPA developed an Administrative Consent Order, effective November 23, 1988, that established a schedule to investigate and remediate offsite groundwater contamination. Phase I of the CERCLA review, conducted in 1989 and 1990, identified contaminants of concern and solid waste management units (SWMUs) that could have contributed to offsite contamination, outlined the physical characteristics of the SWMUs, and described the risk of offsite contamination. Phase II of the CERCLA review, conducted in 1990 and 1991, further assessed the risk of offsite contamination, characterized SWMUs that could have contributed to offsite contamination, and identified migration pathways for contaminants.

## 2.8 Key External Assessments

In April 1985, a DOE task force evaluated the adequacy of practices to support handling of radioactive contaminants in uranium recycle materials at the Oak Ridge Y-12 Plant, the Feed Materials Production Center (in Fernald, Ohio), and the RMI Company (in Ashtabula, Ohio), and examined past operations at the PGDP and the Portsmouth Oxide Conversion Facility. The task force concluded that an in-depth examination of PGDP handling and processing practices was warranted, that quantities of recycle materials with undetermined levels of contaminants were present at PGDP, and that PGDP was periodically receiving commercially-produced UF<sub>6</sub> containing trace levels of transuranic elements. This study recommended that PGDP line management assess worker exposures to transuranic elements and fission products from processing of recycled materials and recommend a feasible method for disposing of uranium recycle material.

An overall concern regarding ES&H conditions at all DOE sites led then-Secretary of Energy Watkins to establish the Tiger Team program and to conduct a Tiger Team assessment of PGDP in June and July 1990. The assessment concluded that ceasing PGDP operations was not warranted, that compliance issues were known by those Federal and State agencies that issue permits, and that the following ES&H and management issues required prompt attention: (1) environmental monitoring and evaluation programs were not being effectively implemented due to a lack of technical direction, formal procedures, and a coordinated quality assurance program; (2) formal procedures for implementing environmental protection activities were lacking, and quality assurance programs had not been implemented for many environmental activities; (3) compliance with DOE orders and mandatory standards for worker safety and health was deficient, as was the system for managing administrative control documents; (4) training and certification programs did not meet site needs; (5) instrument calibration practices did not always meet minimum standards; (6) there was no long-range plan for safe storage of UF<sub>6</sub> cylinders; (7) no integrated sitewide management system was available to track and correct identified deficiencies; (8) DOE was not effectively performing oversight to ensure that ES&H initiatives were being implemented; and (9) the site contractor did not have a corporate strategic plan to accomplish DOE's ES&H objectives.

These issues became the framework for the site's ES&H activities for much of the decade of the 1990s. The site's effectiveness in addressing these concerns, the current ES&H posture of the site, and the transition of the site's uranium enrichment operations to a privatized enterprise (USEC) are documented in the Office of Oversight's report from the first phase of this investigation (*Phase I Independent Investigation of the Paducah Gaseous Diffusion Plant: Environment, Safety, and Health Issues*, October 1999). A detailed discussion of historic hazards at PGDP; operational, maintenance, and environmental activities and practices; and the effectiveness of these practices in addressing historic hazards is provided in Sections 3 and 4 of this report.

## ***SIGNIFICANT PADUCAH PLANT MILESTONES AND EVENTS – 1950 TO 1999***

<i>October 1950</i>	<i>Paducah selected as site for new gaseous diffusion plant</i>
<i>January 1951</i>	<i>Construction begins</i>
<i>July 1952</i>	<i>First uranium received at Paducah</i>
<i>September 1952</i>	<i>Cascade Buildings C-331 and C-333 begin operation</i>
<i>November 1952</i>	<i>First product withdrawn</i>
<i>April 1953</i>	<i>C-400 cleaning building activated</i>
<i>July 1953</i>	<i>Use of reactor tails feed materials begins</i>
<i>April/July 1954</i>	<i>C-335 and C-337 cascades begin operation</i>
<i>August 1954</i>	<i>First Cascade Improvement Program/Cascade Upgrading Program (CIP/CUP)</i>
<i>August 1956</i>	<i>C-420 expansion to feed plant completed</i>
<i>November 1956</i>	<i>Major fire in C-310 product withdrawal area</i>
<i>December 1956</i>	<i>C-340 UF<sub>6</sub> to UF<sub>4</sub> conversion process on stream</i>
<i>January 1957</i>	<i>C-340 uranium derby production started</i>
<i>1957</i>	<i>Presence of neptunium in reactor tails feed at PGDP known</i>
<i>November 1958</i>	<i>Neptunium recovery program begins</i>
<i>April 1960</i>	<i>Technetium recovery program begins</i>
<i>June 1961</i>	<i>First CIP/CUP completed</i>
<i>September 1961</i>	<i>Magnesium fluoride traps installed for neptunium and technetium</i>
<i>March 1962</i>	<i>Explosion and fire in C-340; one fatality</i>
<i>December 1962</i>	<i>Explosion and fire in C-337</i>
<i>January 1963</i>	<i>Technetium traps installed</i>
<i>June 1963</i>	<i>Technetium recovery ends</i>
<i>April 1968</i>	<i>Radiation overexposure to 2 maintenance workers</i>
<i>March 1973</i>	<i>Second CIP/CUP started</i>
<i>October 1973</i>	<i>C-340 uranium derby production discontinued</i>
<i>January 1975</i>	<i>NRC and ERDA assume regulatory responsibilities for AEC activities</i>
<i>mid-1975</i>	<i>Scrap Handling Committee formed</i>
<i>February 1977</i>	<i>Maintenance worker electrocuted in C-331</i>
<i>May 1977</i>	<i>Feed plants cease operation</i>
<i>October 1977</i>	<i>DOE assumes regulatory responsibilities from ERDA</i>
<i>January 1978</i>	<i>Explosion and fire in C-315</i>
<i>1978</i>	<i>Material Terminal Management function established</i>
<i>September 1981</i>	<i>Second CIP/CUP completed</i>
<i>April 1984</i>	<i>Martin Marietta replaces Union Carbide as site operating contractor</i>
<i>February 1985</i>	<i>DOE submits RCRA Part A permit</i>
<i>June 1986</i>	<i>Discovery of major leak of TCE to ground from C-400</i>
<i>November 1988</i>	<i>DOE and EPA sign Administrative Consent Order</i>
<i>June/July 1990</i>	<i>DOE conducts Tiger Team Assessment of Paducah</i>
<i>August 1991</i>	<i>DOE RCRA Part B Permit effective</i>
<i>1992</i>	<i>USEC established</i>
<i>February 1992</i>	<i>Toxicity Characteristic Characterization Procedure Federal Facility Compliance Agreement effective</i>
<i>July 1993</i>	<i>USEC leases enrichment production facilities from DOE, and Lockheed Martin Energy Systems becomes USEC operations and maintenance contractor</i>
<i>July 1993</i>	<i>Lockheed Martin Energy Systems becomes DOE management and operations contractor for environmental management</i>
<i>May 1994</i>	<i>PGDP placed on National Priorities List</i>
<i>June 1995</i>	<i>Martin Marietta becomes Lockheed Martin</i>
<i>October 1995</i>	<i>Site Treatment Plan effective</i>
<i>November 1996</i>	<i>NRC grants certificate of compliance for enrichment operations</i>
<i>March 1997</i>	<i>Regulatory oversight of enrichment transferred from DOE to NRC</i>
<i>February 1998</i>	<i>PGDP Federal Facility Agreement signed by EPA, Commonwealth, and DOE</i>
<i>April 1998</i>	<i>Bechtel-Jacobs awarded DOE management and integration contract</i>
<i>May 1999</i>	<i>USEC takes over direct operation of all enrichment activities</i>